REMARKS

The Office Action dated December 5, 2003, has been received and carefully noted. The amendments made herein and the following remarks are submitted as a full and complete response thereto.

Claims 1, 3, 10, 11, 12, 15, and 16 have been amended, and claim 9 has been cancelled without prejudice. Applicant submits that the amendments made herein are fully supported in the specification and the drawings as originally filed, and therefore no new matter has been added. Accordingly, claims 1-8 and 10-16 are pending in the present application and are respectfully submitted for consideration.

Claims 1, 2 and 10 were rejected under 35 U.S.C. § 102(b) as being anticipated by Pape et al. (U.S. Patent No. 5,047,863, hereinafter "Pape"). Applicant respectfully submits that each of claims 1, 2 and 10 recites subject matter that is neither disclosed nor suggested by the cited prior art.

Claim 1 recites an image processing apparatus for processing image data supplied from an image sensor. The image processing apparatus includes a delay circuit for receiving image data sequentially supplied from the image sensor, delaying the received image data by a time required for defect correction process, and supplying the delayed image data, a memory having a first field for storing image data of one frame and a second field for storing position data of a defective pixel of the image sensor, a counter for counting the number of pixels of image data sequentially transferred from the image sensor, and a defect correction circuit for image data for each pixel based on image data of pixels adjacent to a pixel of interest, and control

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means for writing the image data supplied from said defect correction circuit in the first field of said memory at a storage location corresponding to the defect pixel, if a count of said counter becomes coincident with a number corresponding to the position data of the defective pixel in the second field of said memory, and writing the image data supplied from the delay circuit in the first field, if the count is not coincident with the number corresponding to the position data of the defective pixel.

Claim 10 recites an image processing method of processing image data supplied from an image sensor, having the steps of reading defective pixel position data of the image sensor from a memory, sequentially fetching the image data from the image sensor, giving a delay, and supplying the delayed image data, counting the number of pixels of the image data fetched from the image sensor, forming corrected image data for each pixel based on image data of pixels adjacent to a pixel of interest, and selecting one of outputs of steps (b) and (d), and writing the corrected image data in the memory at a storage location corresponding to the defective pixel, if a count becomes coincident with a number corresponding to the position data of the defective pixel, and writing the image data not corrected and supplied from the image sensor after the delay in the memory, if the count is not coincident with the number corresponding to the position data of the defective pixel.

Accordingly, at least one of the essential features of the present invention is "a defect correction circuit for image data for each pixel based on image data of pixels adjacent to a pixel of interest." As such, the present invention results in the advantage of correcting data of defective pixels at a high speed and with a simple circuit structure.

It is respectfully submitted that the prior art fails to disclose or suggest the elements of the Applicants' invention as set forth in claims 1, 2 and 10, and therefore fails to provide the advantages that are provided by the present application.

Pape discloses a circuit 10 for detecting and correcting for pixel defects in a charge injection device 12 (CID). A digital representation of the dark current of each pixel 14 is stored in a frame buffer at addresses corresponding to the locations of each pixel 14 in the CID array 12. When the CID 12 is subsequently exposed to incident scene light, pixel data from the CID is input to the frame buffer 16 on a pixel-by-pixel basis for each corresponding location therein. If the dark current data stored in the frame buffer 16 at any particular pixel location exceeds a given threshold indicative of a bad or defective pixel, image scene data from the prior pixel is substituted therefor in the frame buffer. An output register 34 is coupled to the frame buffer 16 for clocking in digital values of the CID pixels 14 in accordance with pulses on write input (W) 36 and clock input 37 of the frame buffer 16. A digital to analog converter (D/A) 38 is coupled to the output 40 of the frame buffer 16 and senses the dark current data stored therein for each address on a pixel-by-pixel basis in accordance with pulses on read input (R) 38 and clock input 37. If the dark pixel data exceeds the threshold, output register 34 is not clocked. Therefore, the current data representation of the prior pixel is retained in the register 34 and thereafter read into the frame buffer 16. Thus, if a particular pixel (n) is defective, the data from the previous pixel (n-1) is substituted for the actual data produced by such defective pixel.

Applicant respectfully submits that each and every element recited within claims 1 and 10 is neither disclosed nor suggested by Pape. In particular, Applicant submits that the image processing apparatus and the image processing method as recited in the present application is clearly distinct from that which is illustrated by the combination of the cited prior art. Specifically, it is submitted that the cited prior art fails to disclose or suggest at least the limitations of "a counter for counting the number of pixels of image data sequentially transferred from the image sensor, and a defect correction circuit for image data for each pixel based on image data of pixels adjacent to a pixel of interest" with respect to claim 1, and the steps of "counting the number of pixels of the image data fetched from the image sensor, and forming corrected image data for each pixel based on image data of pixels adjacent to a pixel of interest."

The Examiner took the position that the clock pulses 18 in Pape act as a counter. However, it is submitted that the clock pulses of Pape are "counting" the number of pixels transferred from the imager 12, and that Pape does not disclose a summation of the pixels. In fact, Pape merely discloses that clock pulses to input 18 cause the CID 12 to clock out analog pixel data on a pixel by pixel basis to a level shifting device 20 which matches the voltage or current produced by the CID 12 to the correction circuitry 10 (see column 3, lines 58-62 of Pape), rather than a counter for counting the number of pixels of image data sequentially transferred from the image sensor as recited in the claimed invention.

Furthermore, Pape discloses that the image data from the imager 12 is A/D converted in A/D converter 28 and thereafter stored in the output register 34, on a pixel

by pixel basis (column 4, lines 50-61 of Pape), and is subsequently written in a frame memory 16. The frame memory 16 also stores dark current of each pixel (column 3, lines 42-46 of Pape). When the dark current of Pape is above the threshold level, the A/D converter 28 and the register 34 are disabled, and the previous pixel data is used for the defective pixel (column 4, line 67 to column 5, line 11 of Pape). Accordingly, Pape does not disclose or suggest a defect correction circuit for supplying corrected image data for each pixel. In other words, Pape merely teaches a serial connection of a circuit for supplying the normal data and a circuit for correcting the image data, and does not teach nor suggest the parallel connection of a normal image data supply path and a corrected image data supply path.

In view of the above, Applicant submits that Pape fails to disclose or suggest each and every element recited in claims 1 and 10 of the present application, and therefore is allowable.

Claim 2 is dependent on independent claim 1. As such, claim 2 is allowable due to its dependency on allowable claim 1.

Claims 3-8, 11, and 12 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Pape in view of Rambaldi et al. (U.S. Patent No. 6, 618,084). In addition, claims 13-16 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Pape in view of Tabei (U.S. Patent No. 5,805,216). Applicant respectfully submits that each of claims 3-8 and 11-16 recites subject matter that is neither disclosed nor suggested by the cited prior art.

It is submitted that each of claims 3-8 and 11-16 is dependent on independent claims 1 and 10, respectively. As such, each of claims 3-8 and 11-16 is allowable due to its dependency on allowable claims 1 and 10, respectively.

Claim 9 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Pape in view of Hurst et al. (U.S. Patent No. 4,654,714). Claim 9 has been canceled without prejudice, and therefore the rejection with respect to this claim is now moot.

In view of the above, Applicant respectfully submits that each of claims 1-8 and 10-16 recites subject matter that is neither disclosed nor suggested in the cited prior art. Applicant also submits that the subject matter is more than sufficient to render the claims non-obvious to a person of ordinary skill in the art, and therefore respectfully request that claims 1-8 and 10-16 be found allowable and that this application be passed to issue.

If for any reason, the Examiner determines that the application is not now in condition for allowance, it is respectfully requested that the Examiner contact the Applicant's undersigned attorney at the indicated telephone number to arrange for an interview to expedite the disposition of this application.

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In the event this paper has not been timely filed, the Applicant respectfully petitions for an appropriate extension of time. Any fees for such an extension, together with any additional fees that may be due with respect to this paper, may be charged to counsel's Deposit Account No. 01-2300 referencing Attorney Docket No. 107317-00003.

Respectfully submitted,

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Enclosure: Petition for Extension of Time (1 month)

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